

Earth's Biological History

8.2 The student will demonstrate an understanding of Earth's biological diversity over time. (Life Science, Earth Science)

8.2.2 Summarize how scientists study Earth's past environment and diverse life-forms by examining different types of fossils (including molds, casts, petrified fossils, preserved and carbonized remains of plants and animals, and trace fossils).

Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/Future knowledge: In 3rd grade, students recognized types of fossils (including molds, casts, and preserved parts of plants and animals) (3-3.3) and inferred ideas about Earth's early environments from fossils of plants and animals that lived long ago (3-3.4). In 4th grade (4-2.1) and 6th grade (6-3.1), students classified groups of organisms showing the diversity of life-forms on Earth today. Further study on this topic will be part of high school Earth Science.

It is essential for students to know that a *fossil* is the preserved remains or traces of an organism that lived in the past, usually more than 10,000 years ago. Fossils give clues to the diversity of living things over the history of Earth, give clues to past climate and surface changes on Earth, and give clues to changes that have occurred with organisms over time.

NOTE TO TEACHER: Students need to study the formation process of mold, cast, petrified, preserved, carbonized, and trace fossils.

There are different types of fossils based on how they were formed. The environmental conditions that favor fossil formation are also essential to this study.

- *Mold fossil* – forms when sediments bury an organism and the sediments change into rock; the organism decays leaving a cavity in the shape of the organism.
- *Cast fossil* – forms when a mold is filled with sand or mud that hardens into the shape of the organism.
- *Petrified fossil (permineralized fossil)* – forms when minerals soak into the buried remains, replacing the remains, and changing them into rock.
- *Preserved fossil* – forms when entire organisms or parts of organisms are prevented from decaying by being trapped in rock, ice, tar, or amber.
- *Carbonized fossil* – forms when organisms or parts, like leaves, stems, flowers, fish, are pressed between layers of soft mud or clay that hardens squeezing almost all the decaying organism away leaving the carbon imprint in the rock.
- *Trace fossil* – forms when the mud or sand hardens to stone where a footprint, trail, or burrow of an organism was left behind.

Millions of fossils have been collected and studied. The *fossil record* gives important information about past life and environments on Earth. Certain fossilized organisms could only live in specific environments or under particular climate conditions. Extinction of life-forms as well as how and when new life-forms appeared is part of the fossil record.

NOTE TO TEACHER: This is not a study of evolutionary change, but a study of how fossils can show structural similarities and differences in organisms over time revealing the vast diversity of life forms that have and continue to exist here.

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It is not essential for students to know the evolutionary relationships among organisms that scientists are studying.

Assessment Guidelines:

The objective of this indicator is to *summarize* how scientists study Earth's past environment and diverse life-forms by examining different types of fossils; therefore, the primary focus of assessment should be to generalize major points about the fossils listed in the indicator, fossil formation, and evidence gleaned from the fossil record. However, appropriate assessments should also require students to *identify* a type of fossil from its description or formation process; *compare* one type of fossil to another or one life-form with a related form in Earth history; *identify* an environmental condition evident because of a fossil presence; or *exemplify* the changes in a species over time in Earth's history using the fossil record.